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Six Species of *Lumbrinerides* (Polychaeta, Lumbrineridae) from Japan

By

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Abstract Six species of the genus *Lumbrinerides* are newly added to the Japanese fauna. Material includes four new species, *L. hayashii* from Wakasa Bay, *L. shimo-daensis* and *L. lineatus* from Shimoda, Izu Peninsula, and *L. bidentatus* from Tsushima Strait, and a new subspecies, *L. acutus japonicus* from Shimoda. *Lumbrinerides dayi* from Shimoda is first recorded from the Pacific Ocean.

Previously, 13 species belonging to four genera, *Augeneria*, *Ninoe*, *Lumbrineriopsis* and *Lumbrineris*, of the family Lumbrineridae were reported by IMAJIMA and HIGUCHI (1975), but species of *Lumbrinerides* were not included in the paper.

Recently, the author found specimens of *Lumbrinerides* from material obtained from the Tsushima Strait and near Shimoda, Izu Peninsula. Two specimens collected from the Wakasa Bay by Dr. Isao HAYASHI were also added.

In the present study, six species of *Lumbrinerides* are recognized; the material includes four new species and one new subspecies, and *Lumbrinerides dayi* is newly recorded from the Pacific Ocean.

The author wishes to thank Mr. Thomas H. PERKINS, Florida Department of Natural Resources, St. Petersburg, Florida, and Ms. Susan J. WILLIAMS, Allan Hancock Foundation, University of Southern California, Los Angeles, for critically reading the manuscript. Thanks are also due to Dr. Isao HAYASHI, Kyoto University, for the use of material and to Dr. Kristian FAUCHALD of the National Museum of Natural History, Washington D. C., for arranging loans of type material.

The bulk of the collection including type specimens has been deposited in the National Science Museum, Tokyo.

Family Lumbrineridae MALMGREN, 1867

Genus *Lumbrinerides* ORENSANZ, 1973

Prostomium long, distally pointed. Peristomium composed of one or two apodus segments. Notopodial rudiment absent. Some anterior parapodia reduced. Setae include simple bidentate hooded hooks and broadly limbate setae. Pygidium discoïdal, without cirri. Mandibles completely fused proximally into a median appendage and distally contiguous. Maxillary carriers broadly triangular. Maxilla I with cutting

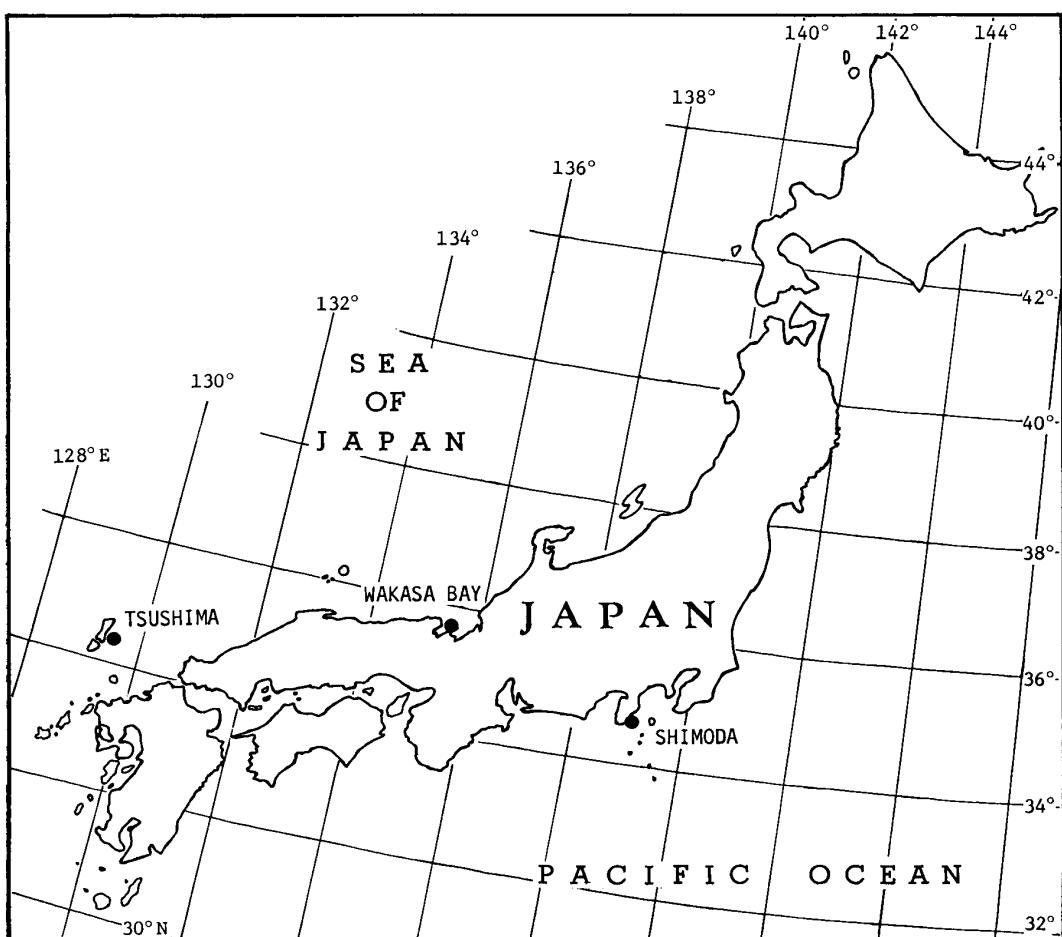


Fig. 1. Map of the Japanese waters, showing localities mentioned in the text.

edge sinuous or dentate. Maxilla II with two to three blunt teeth. Maxilla III unidentate. Maxilla IV with rounded plate.

Key to Species of *Lumbrinerides* from Japan

1. Maxilla I with one rounded accessory tooth on cutting edge (Fig. 7h).....
..... *L. acutus japonicus* subsp. nov.
- 1'. Maxilla I with two accessory teeth on cutting edge..... 2
2. Two accessory teeth of maxilla I close to each other (Fig. 6i) .. *L. dayi* PERKINS
- 2'. Two accessory teeth of maxilla I far apart from each other..... 3
3. Accessory teeth of maxilla I equal, rounded; cutting edge of maxilla I without deep basal notch (Fig. 2i)..... 4
- 3'. Accessory teeth of maxilla I unequal, proximal one small, pointed; cutting edge of maxilla I with deep basal notch (Fig. 4g)..... 5
4. First 10 parapodia reduced; hooks beginning on first parapodia..... *L. hayashii* sp. nov.

4'. First 3 parapodia reduced; hooks beginning on eighth parapodia.....
 *L. shimodaensis* sp. nov.

5 Maxilla II with three rounded teeth (Fig. 4i, j).....*L. lineatus* sp. nov.

5'. Maxilla II with two rounded teeth (Fig. 5k, l).....*L. bidentatus* sp. nov.

Lumbrinerides hayashii sp. nov.

(Fig. 2, a-i)

Material examined. Wakasa Bay, in 10 m (holotype and paratype), coll. I. HAYASHI.

Description. Specimens are two anterior fragments; the holotype is the largest, measuring 13 mm in length and about 0.7 mm in width for 43 setigerous segments.

The prostomium is conical, with longitudinal and transversal wrinkles, and tapers anteriorly to a short acute tip. It measures 0.8 mm in length and 0.45 mm in width at the widest part. The peristomium is composed of two apodus segments; its total length is slightly longer than the first setigerous segment (Fig. 2a). Eyes are not visible.

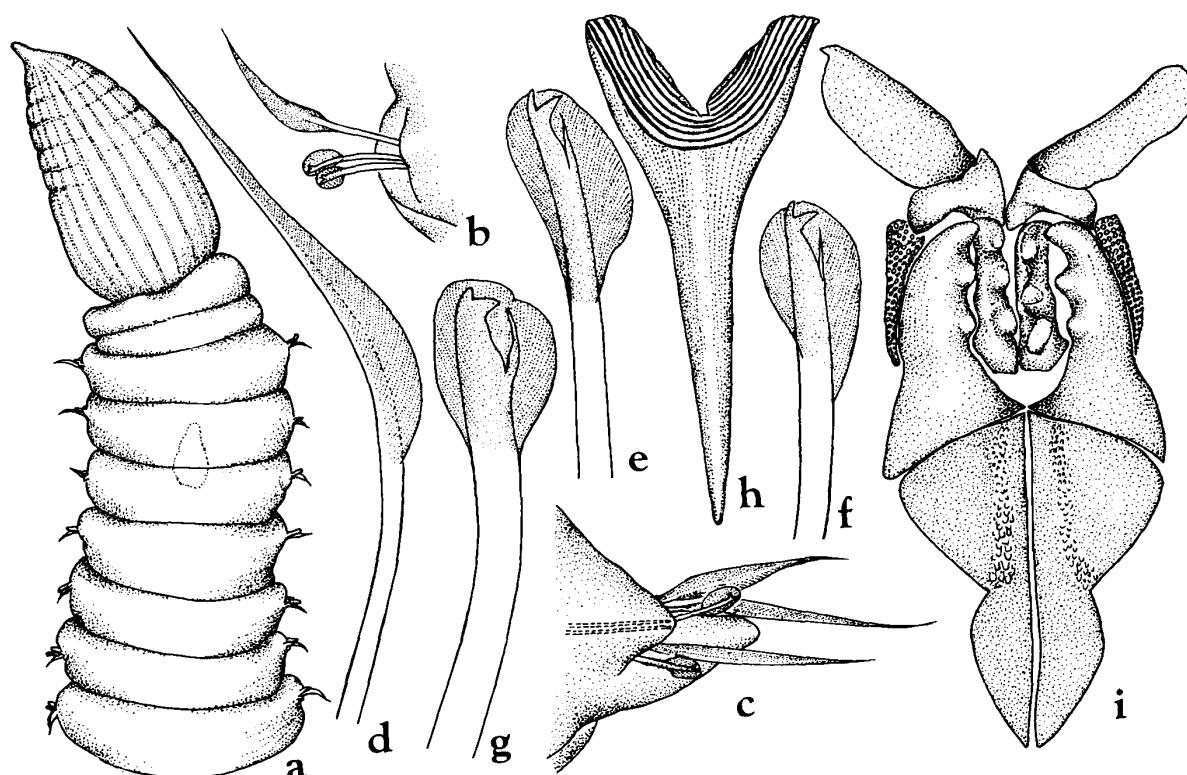


Fig. 2. *Lumbrinerides hayashii* sp. nov. a, anterior end, dorsal view, $\times 36$; b, first parapodium, anterior view, $\times 167$; c, 34th parapodium, anterior view, $\times 167$; d, limbate seta, $\times 335$; e, f, bidentate hooded hooks from first parapodium, $\times 825$; g, hook from 34th parapodium, $\times 570$; h, mandibles, ventral view, $\times 90$; i, maxillae, dorsal view, $\times 110$.

The first ten parapodia are reduced, with small, rounded setal and postsetal lobes (Fig. 2b). Farther back, parapodia increase in size, with a triangular setal lobe and a digitate postsetal lobe (Fig. 2c). All parapodia of the incomplete type have broadly limbate setae with a pointed tip (Fig. 2d) and simple, bidentate, hooded hooks. The first parapodia have two hooks; each hook has an apical tooth directed distally and a fang directed obliquely (Fig. 2e, f). The shaft of posterior hooks becomes thicker than anterior ones; each hook has a short, thick apical tooth and a fang (Fig. 2g). Acicula are yellow and number two per parapodium.

Mandibles are widely flared anteriorly and are posteriorly prolonged with a rounded end; they are about 2.3 times longer than broad (Fig. 2h). Maxillary carriers are broadly triangular, with conspicuously constricted lateral borders. Each maxilla I has two large accessory teeth on the cutting edge; these teeth are located far apart from each other. Each maxilla II has three large, blunt teeth; maxillae III and IV have each one tooth (Fig. 2i).

Remarks. *Lumbrinerides hayashii* grossly resembles *L. acutiformis* (GALLARDO, 1968) from Viet Nam in the structure of the maxillary plates and in the occurrence of hooks beginning on the first parapodia. Based upon a personal communication by Ms. S. WILLIAMS, the holotype of *L. acutiformis* deposited in the Allan Hancock Foundation is in poor condition, but it appears that the first five or six parapodia are reduced; thereafter, the postsetal lobes elongate. Also, it has a very elongated prostomium; the form is different from that of *L. hayashii*. Moreover, *L. hayashii* is separable from *L. acutiformis* in the following characteristics; (1) mandibles are 2.3 times longer than broad, instead of 3 times, and (2) teeth of maxillae II are widely spaced rather than near the anterior end.

Lumbrinerides hayashii is also allied to *L. shimodaensis* (described below) in the maxillary plates, but *L. shimodaensis* has the first three parapodia reduced; the parapodia are normal sized from setiger five. Moreover, in *L. hayashii*, hooded hooks are present from the first parapodia, but in *L. shimodaensis* hooks appear the eighth parapodia.

Type series. Holotype, NSMT-Pol. H 195; paratype, NSMT-Pol. P 196.

Etymology. The new species is named after Dr. I. HAYASHI of the Kyoto University, who collected the material from Wakasa Bay.

Distribution. Japan.

Lumbrinerides shimodaensis sp. nov.

(Fig. 3, a-i)

Material examined. Near Shimoda, Izu Peninsula, 34°41.1'N, 139°00.0'E—34°40.9'N, 138°59.8'E, in 59–50 m (holotype).

Description. The holotype is an anterior fragment; it measures 3 mm in length and 0.5 mm in width for 15 setigerous segments.

The prostomium is conical with an acute distal tip; it is 1.2 times longer than

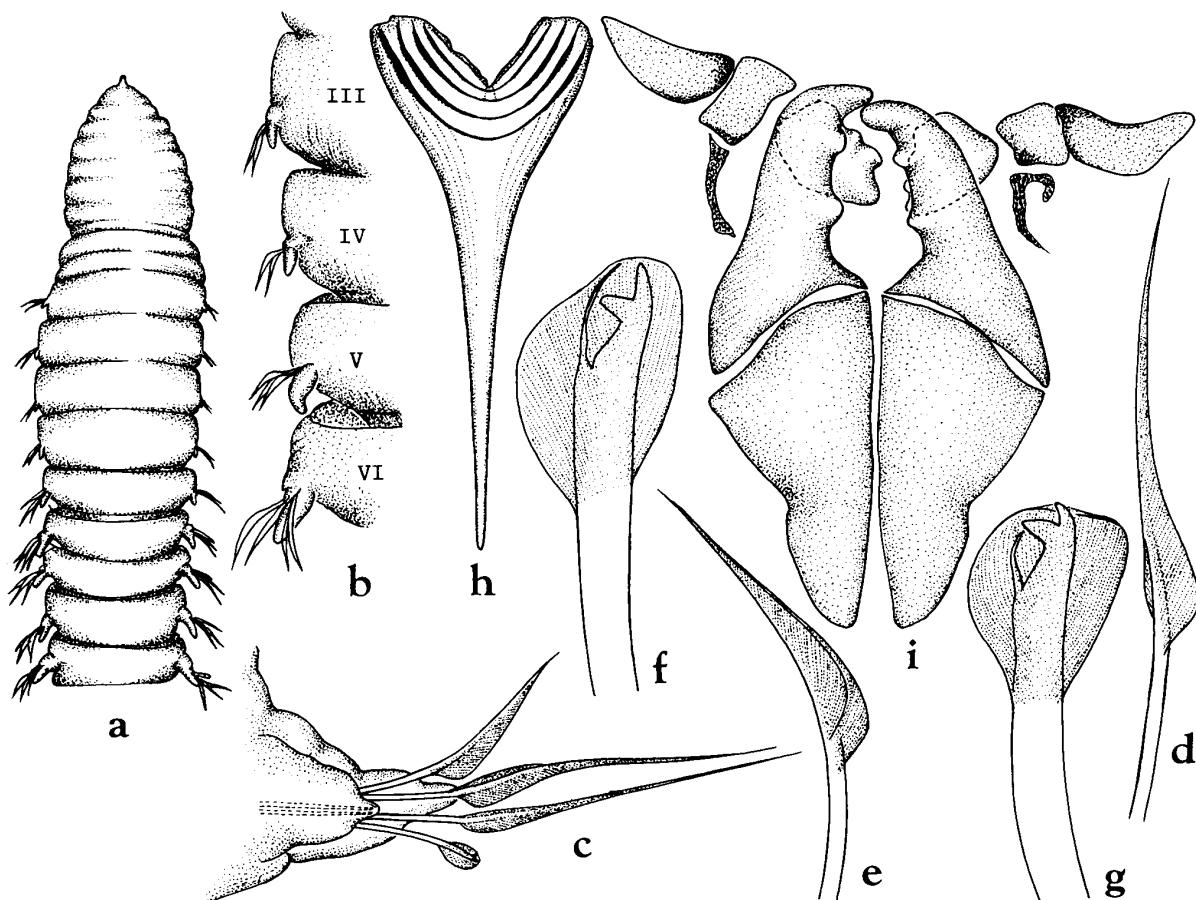


Fig. 3. *Lumbrinerides shimodaensis* sp. nov. a, anterior end, dorsal view, $\times 35$; b, anterior body, left side, showing the third to sixth setigerous segments, $\times 105$; c, 12th parapodium, anterior view, $\times 165$; d, e, limbate setae from 12th parapodium, $\times 320$; f, bidentate hooded hook from eighth parapodium, $\times 950$; g, hook from 12th parapodium, $\times 950$; h, mandibles, ventral view, $\times 100$; i, maxillae, dorsal view, $\times 125$.

broad, without eyespots. The peristomium is composed of two apodus segments, and their total length is equal to that of the first setigerous segment (Fig. 3a). Anterior three parapodia are reduced, with small setal and postsetal lobes. Parapodia are moderately developed on the fourth setigerous segment and fully developed from the fifth setigerous segment (Fig. 3b). Normal parapodia have a conical setal and an elongated postsetal lobes; the postsetal lobe is about 2 times as long as the setal lobe (Fig. 3c). A setal fascicle is composed of broadly limbate setae with slender pointed tips (Fig. 3d, e), numbering three on the 12th parapodia. A simple, bidentate hooded hook is first present from eighth parapodia, emergent at the infra-acicicular position. Anterior hooks have a fang directed laterally, nearly at right angles to the shaft, and the apical tooth is directed distally (Fig. 3f). In more posterior parapodia the apical tooth of hooks is directed obliquely (Fig. 3g). Acicula number two in each parapodium. Mandibles are flared widely anteriorly and prolonged and very slender with an

entire end posteriorly; they are 2.5 times longer than broad (Fig. 3h). Maxillary carriers are broadly triangular, with constricted lateral borders. Each maxilla I has two large, similar, rounded accessory teeth located far apart from each other. Each maxilla II has three blunt teeth; maxillae III and IV have each one tooth. Lateral accessory supports are present along outer sides of maxillae I (Fig. 3i).

Remarks. *Lumbrinerides shimodaensis* is similar to *L. acutiformis* (GALLARDO, 1968) from Viet Nam, *L. platypygos* (FAUCHALD, 1970) from Baja California, *L. gesae* ORENSANZ, 1974, off Mar del Plata, Argentina, *L. dayi* PERKINS, 1979, from North Carolina, *L. hayashii* sp. nov., and others in having two large accessory teeth on the cutting edge of maxilla I. However, *L. shimodaensis* is distinguishable from *L. dayi*, *L. platypygos* and *L. gesae* in having the two accessory teeth far apart each other on the cutting edge and closely resembles *L. acutiformis* and *L. hayashii* in this character.

Lumbrinerides shimodaensis may be distinguishable from *L. acutiformis* as follows: (1) the mandibles are 2.5 times longer than broad, instead of 3 times; and (2) the prostomium is 1.2 times longer than broad, instead of 2.5 times by GALLARDO's description or 3 times by his illustration (Pl. 29, fig. 2). *Lumbrinerides shimodaensis* may be distinguished from *L. hayashii* as indicated in remarks under that species.

Type series. Holotype, NSMT-Pol. H 197.

Etymology. This species is named after Shimoda, Izu Peninsula, the region where the holotype was found.

Distribution. Japan.

Lumbrinerides lineatus sp. nov.

(Fig. 4, a-j)

Material examined. Near Shimoda, Izu Peninsula, 34°39.9'N, 139°00.1'E—34°39.6'N, 139°00.0'E, in 70–63 m (holotype); 34°41.0'N, 139°01.1'E—34°40.7'N, 139°00.6'E, in 102–92 m (paratype).

Description. The holotype measures 5 mm in length and about 0.4 mm in width for 23 setigerous segments.

The prostomium is conical, transversely wrinkled, about 2 times longer than broad and has a short acute tip. The peristomium is composed of two apodus segments; its total length is slightly greater than the first setigerous segment (Fig. 4a).

Parapodia of first five setigerous segments are small, with rounded setal lobes and short postsetal lobes; farther back parapodia gradually increase in length, and each has a rounded setal lobe and a conical postsetal lobe (Fig. 4b). All parapodia have broadly limbate setae (Fig. 4c), and a simple, bidentate hooded hook is present from eighth parapodia. Anterior hooks have a thick fang and a slender apical tooth; both are directed obliquely (Fig. 4d). Posteriorly, fangs and apical teeth of hooks become thicker than those of anterior hooks (Fig. 4e). Acicula number two in each parapodium.

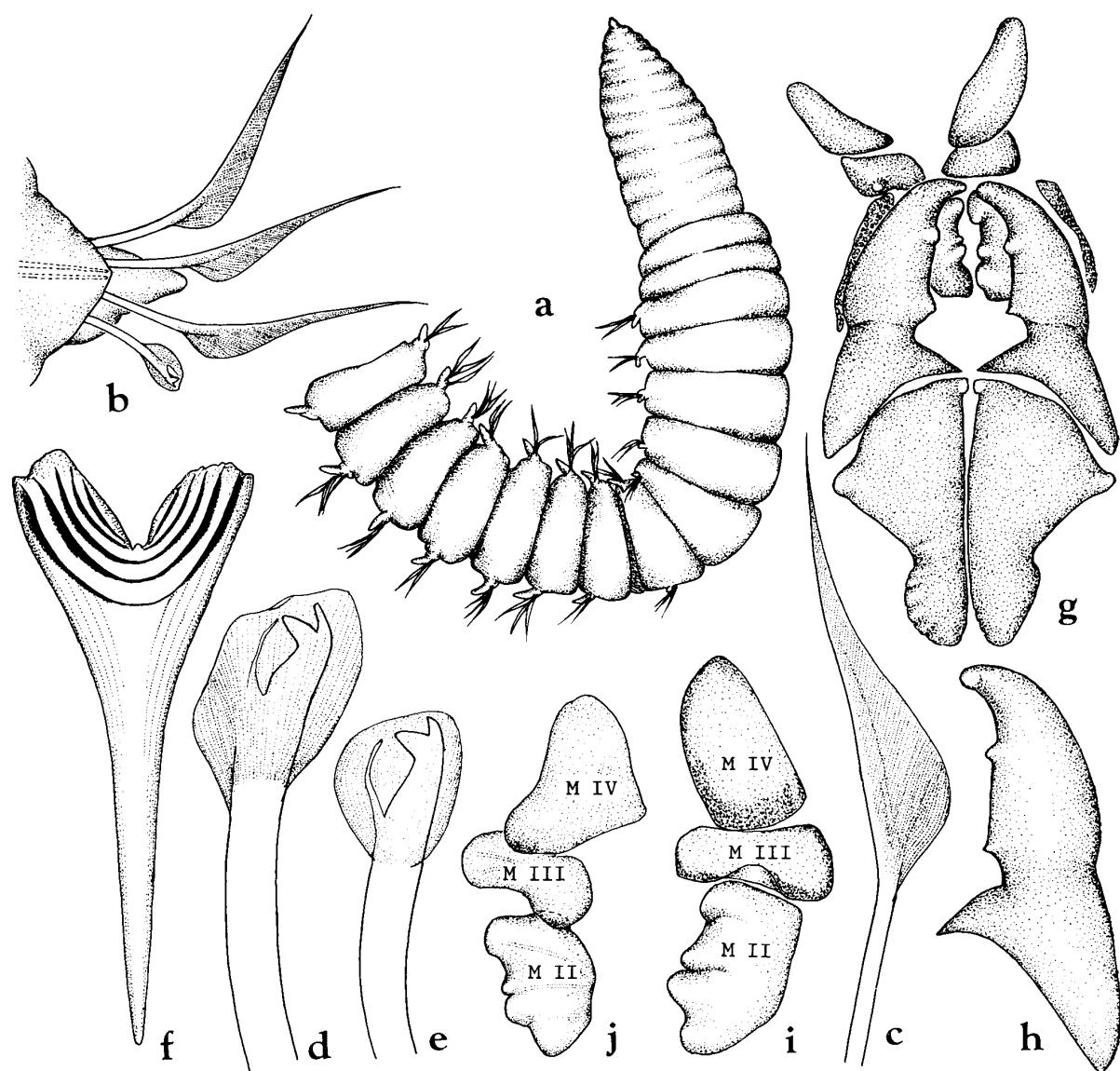


Fig. 4. *Lumbrinerides lineatus* sp. nov. a, anterior end, dorsal view, $\times 40$; b, ninth parapodium, anterior view, $\times 205$; c, limbate seta from ninth parapodium, $\times 445$; d, bidentate hooded hook from ninth parapodium, $\times 950$; e, hook from 23rd parapodium, $\times 950$; f, mandibles, ventral view, $\times 125$; g, maxillae, dorsal view, $\times 125$; h, right maxilla I, $\times 165$; i, maxillae II, III, IV from holotype, $\times 165$; j, maxillae II, III, IV from paratype, $\times 165$.

Mandibles are widely flared anteriorly and prolonged posteriorly with a rounded end; they are 2.5 times longer than broad (Fig. 4f). Maxillary carriers are broadly triangular, with constricted lateral borders. Each maxilla I is falcate with a deep notch at the inner basal part; it has two accessory teeth on the cutting edge, the proximal tooth is smaller than the distal one and pointed (Fig. 4g, h). Each maxilla II has three blunt teeth; the second and third teeth are closely appressed (Fig. 4i, j). Maxillae III and IV have each one tooth. Lateral accessory supports are present along outer

sides of maxillae I.

Remarks. *Lumbrinerides lineatus*, *L. bidentatus* sp. nov., and *L. crassicephala* (HARTMAN, 1965) from the Bermuda slope, in 1000 m are similar in having a notch at the inner basal parts of maxillae I. However, maxillae I of *L. lineatus* and *L. bidentatus* are more deeply notched at inner basal part than that of *L. crassicephala*. Moreover, they differ in that *L. crassicephala* has one apodus peristomial segment, instead of two segments, and lateral supports are very long and prominent, instead of the normal length. *Lumbrinerides lineatus* and *L. bidentatus* may be distinguished from each other as indicated in remarks under the latter.

Type series. Holotype, NSMT-Pol. H 198; paratype, NSMT-Pol. P 199.

Distribution. Japan.

Lumbrinerides bidentatus sp. nov.

(Fig. 5, a-l)

Material examined. Around Tsushima, 34°23.1'N, 129°27.5'E, in 85 m (holotype and paratype), 34°03.3'N, 129°04.5'E, in 125 m (1).

Description. All specimens are anterior fragments; the holotype measures 6 mm in length and 0.33 mm in width for 30 setigerous segments; and the paratype is 13 mm in length and 0.4 mm in width for 72 setigerous segments.

The prostomium is conical with a short acute tip; it is about 2 times longer than broad. The peristomium is composed of two apodus segments; it is as long as the first setigerous segment (Fig. 5a, b).

Some anterior parapodia are reduced. The holotype has three anterior reduced parapodia with small setal and postsetal lobes; fourth parapodia are moderately developed and fifth parapodia are fully developed (Fig. 5c). The paratype has four anterior reduced parapodia, and parapodia are fully developed from the sixth setigerous segment. Normal parapodia have triangular setal and postsetal lobes; the postsetal lobe is about 2 times as long as the setal one (Fig. 5d). All parapodia have broadly limbate setae (Fig. 5e), and simple, bidentate hooded hooks are present from sixth parapodia in the holotype and seventh parapodia in the paratype. Anterior hooks have a fang directed obliquely to the shaft, and the apical tooth is directed distally (Fig. 5f). In more posterior hooks, the fang is directed laterally, nearly at right angles to the shaft, and the apical tooth is thick (Fig. 5g). Acicula number two in each parapodium.

Mandibles are flared widely anteriorly and prolonged with a notched end posteriorly; they are about 2.5 times longer than broad (Fig. 5h). Maxillary carriers are broadly triangular, with constricted lateral borders (Fig. 5i). Each maxilla I is falcate and deeply notched at its inner basal part. There are two accessory teeth far apart each other on the cutting edge; the distal tooth is large, rounded and situated near the tip, while the proximal one is small, pointed and located basally (Fig. 5j). Each maxilla II is bidentate, with a large proximal, triangular boss (Fig. 5k, l). Maxillae

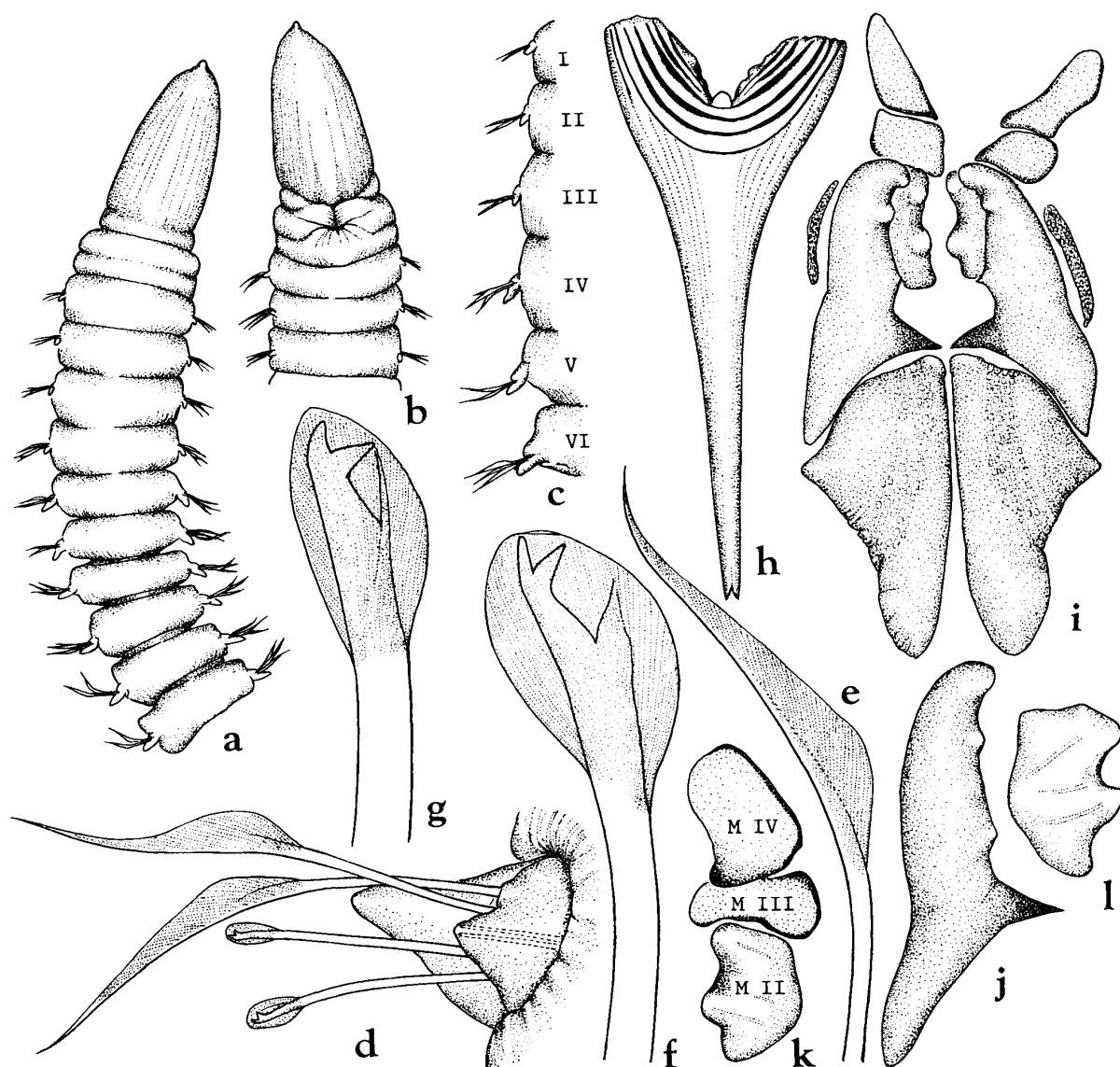


Fig. 5. *Lumbrinerides bidentatus* sp. nov. a, anterior end, dorsal view, $\times 40$; b, the same, showing peristomial segments, ventral view, $\times 40$; c, anterior body, left side, showing the first to sixth parapodia, dorsal view, $\times 65$; d, 13th parapodium, anterior view, $\times 335$; e, limbate seta from 13th parapodium, $\times 520$; f, bidentate hooded hook from seventh parapodium, $\times 1290$; g, hook from 13th parapodium, $\times 1290$; h, mandibles, ventral view, $\times 125$; i, maxillae, dorsal view, $\times 125$; j, left maxilla I from paratype, $\times 165$; k, maxillae II, III, IV from holotype, $\times 165$; l, maxilla II from paratype, $\times 165$.

III and IV have one tooth each; plates are whitish in colour except for a blackish border.

Remarks. *Lumbrinerides bidentatus* is very similar to *L. lineatus* in the structure of maxillae I; both species have a deep notch at the inner basal part. However, the two are separable in the structure of maxillae II, which in *L. lineatus* have three teeth, instead of two in *L. bidentatus*. Additionally, plates of maxillae III and IV of *L. bidentatus* are whitish with blackish borders, in contrast to the dark brown plates of

L. lineatus.

Type series. Holotype, NSMT-Pol. H 200; paratype, NSMT-Pol. P 201.

Distribution. Japan.

Lumbrinerides dayi PERKINS, 1979

(Fig. 6, a-k)

Lumbrinerides dayi PERKINS, 1979, pp. 421-423, figs. 1c-e; MIURA, 1980, pp. 1025-1026, fig. 3B.

Material examined. Near Shimoda, Izu Peninsula, 34°39.9'N, 139°00.4'E—34°39.7'N, 138°59.8'E, in 68-60 m (1); 34°41.1'N, 139°00.0'E—34°40.9'N, 138°59.8'E, in 59-50 m (1).

Description. Of two anterior fragments the largest one measures 5 mm in length and about 0.7 mm in width for 24 setigerous segments.

The prostomium is conical with a short acute tip; it is nearly 1.2 times longer than broad. Eyespots are absent. The two apodus peristomial segments are conspicuous; each is nearly as long as following setigers (Fig. 6a, b).

Anterior seven parapodia are reduced, with small setal and postsetal lobes (Fig. 6c). Farther back, parapodia gradually increase in length, and each has a triangular setal lobe and a digitate postsetal lobe (Fig. 6d). Parapodia have broadly limbate setae (Fig. 6e) and simple bidentate hooded hooks. Hooks are present from the first or fourth setigerous segment, accompanied by limbate setae. Each anterior hook has a slender fang directed obliquely and an apical tooth directed distally (Fig. 6f). The fang becomes thicker posteriorly (Fig. 6g). Acicula number two in each parapodium.

Mandibles are delicate, flared widely anteriorly and prolonged with a small posterior notch; they are 2.4 times longer than broad (Fig. 6h). Maxillary carriers are broadly triangular, with conspicuously constricted lateral borders; each has a longitudinal band of distinct hexagonal cells (Fig. 6i). Each maxilla I has two small accessory teeth located close to each other on the cutting edge (Fig. 6i, j); each maxilla II has three teeth with a large basal boss; maxillae III and IV have each one tooth. Lateral accessory supports are present along outer sides of maxillae I.

Remarks. The species is new to the Japanese fauna. By courtesy of Mr. T. H. PERKINS and Dr. K. FAUCHALD, Japanese specimens were compared with paratypes of *Lumbrinerides dayi* PERKINS, 1979, from Puerto Rico (USNM 52209). These specimens agree with the paratypes, except that each of the peristomial segments is as long as the first setigerous segment, instead of the two peristomial segments together being equal in length to the first setigerous segment. In other respects, PERKINS described parapodia on page 422 in his paper as follows: ". . . . fully developed by setiger 10-12; setal lobes short, blunt, conical, slightly longer than wide, about 1/10 as long as body width; postsetal lobes rounded, about as long as setal lobes." Fully developed postsetal lobes of the paratypes are digitate and longer than setal lobes (Fig. 6k).

Distribution. North Carolina, Florida, Puerto Rico; Japan.

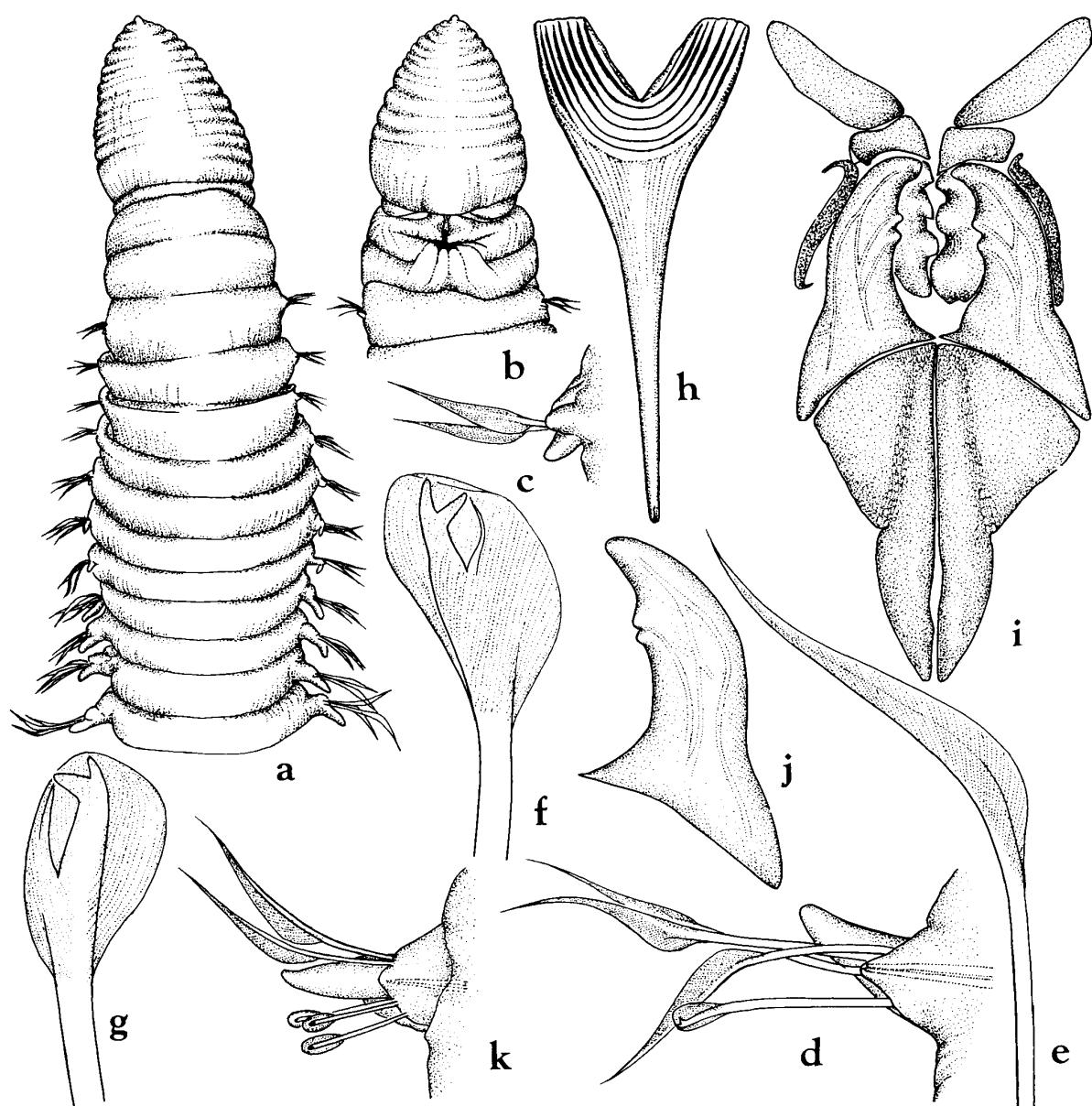


Fig. 6. *Lumbrinerides dayi* PERKINS. a, anterior end, dorsal view, $\times 35$; b, the same, ventral view, showing peristomial segments, $\times 35$; c, second parapodium, ventral view, $\times 165$; d, 19th parapodium, anterior view, $\times 165$; e, limbate seta from 19th parapodium, $\times 335$; f, bidentate hooded hook from seventh parapodium, $\times 735$; g, hook from 19th parapodium, $\times 950$; h, mandibles, ventral view, $\times 88$; i, maxillae, dorsal view, $\times 110$; j, right maxilla I from other individual, $\times 345$; k, 20th parapodium from paratype (USNM 52209), anterior view, $\times 165$.

Lumbrinerides acutus japonicus subsp. nov.

(Fig. 7, a-h)

Material examined. Near Shimoda, Izu Peninsula, $34^{\circ}39.9'N$, $139^{\circ}00.1'E$ —

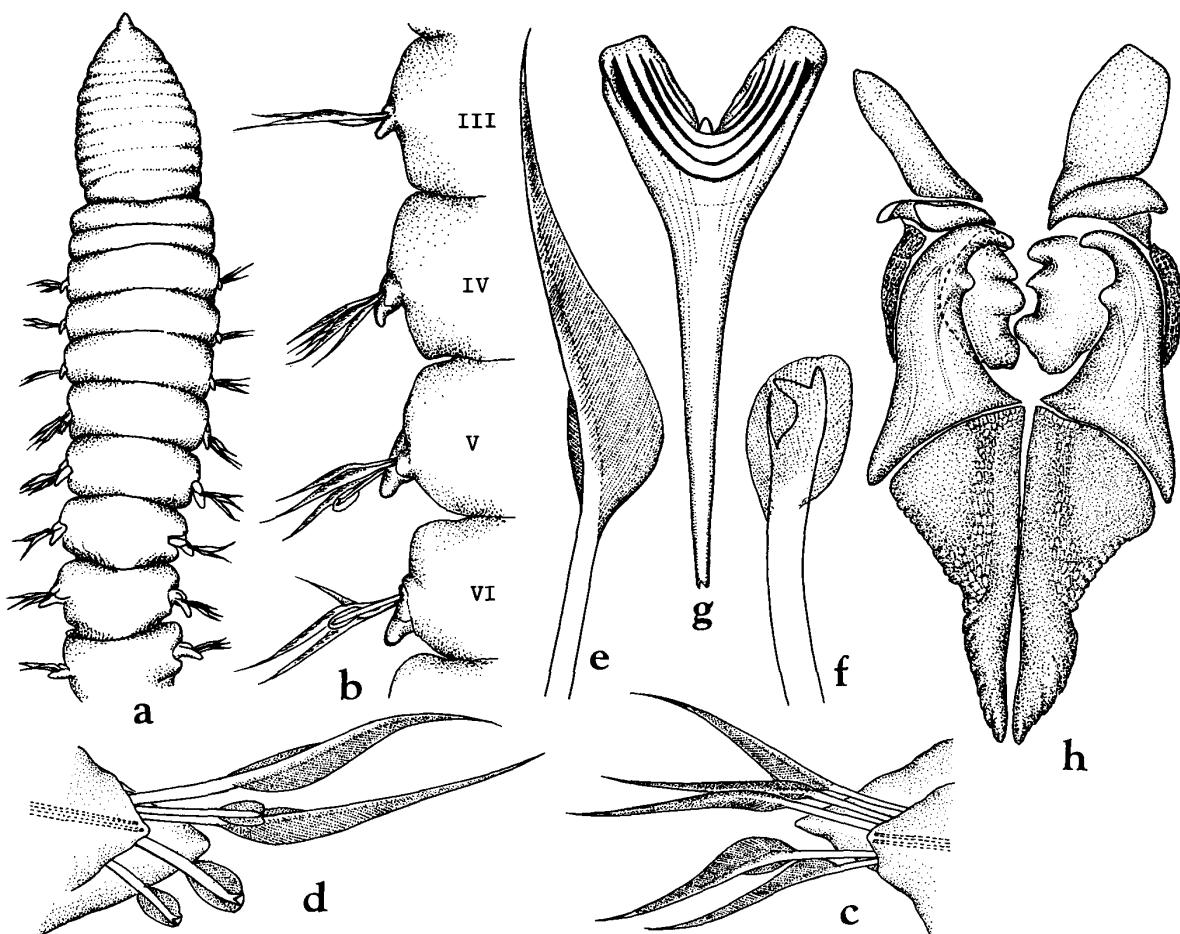


Fig. 7. *Lumbrinerides acutus japonicus* subsp. nov. a, anterior end, dorsal view, $\times 40$; b, anterior body, left side, showing the third to sixth parapodia, dorsal view, $\times 110$; c, fourth parapodium, anterior view, $\times 335$; d, 24th parapodium, anterior view, $\times 205$; e, limbate seta from fifth parapodium, $\times 545$; f, bidentate hooded hook from 24th parapodium, $\times 825$; g, mandibles, ventral view, $\times 100$; h, maxillae, dorsal view, $\times 125$.

34°39.6'N, 139°00.0'E, in 70–63 m (holotype); 34°40.9'N, 139°01.1'E–34°40.5'N, 139°00.9'E, in 55–50 m (paratype); 34°41.1'N, 139°00.2'E–34°40.9'N, 138°59.7'E, in 60–50 m (paratype).

Description. All specimens are anterior fragments; the holotype measures 5 mm in length and 0.37 mm in width for 28 setigerous segments; the largest paratype measures 8 mm in length and 0.6 mm in width for 44 setigerous segments.

The prostomium is conical with a short acute tip and about 1.5 times longer than broad with many transverse wrinkles. The peristomium is composed of two apodus segments and its total length is equal to that of the first setigerous segment (Fig. 7a).

Parapodia of the first three setigers are small, with rounded setal lobes and short postsetal lobes. They gradually increase in length posteriorly from the next segment (Fig. 7b). Fourth parapodia have a rounded setal lobe and a triangular postsetal

lobe (Fig. 7c). Fully developed parapodia have a triangular setal lobe and a conical postsetal lobe; the postsetal lobe is about twice as long as the setal lobe (Fig. 7d). Anterior parapodia have three to five broadly limbate setae with slender pointed tips (Fig. 7e). Posterior parapodia usually have a single seta of this type. Simple, hooded hooks are first present on the fifth setigerous segment, emergent at the inferior end of the fascicle. These hooks are distally bifid with the larger fang directed laterally, nearly at right angles to the shaft, and the apical tooth directed distally; they are surrounded by a rounded hood (Fig. 7f). Two paratypes have such hooks from fourth or fifth parapodia. Acicula are pale and occur two in each parapodium.

Mandibles are 2.6 times longer than broad, flared widely anteriorly, and slender with a small notch posteriorly (Fig. 7g). Maxillary carriers are broadly triangular, with constricted lateral borders. Each maxilla I is falcate, with one large rounded, accessory tooth at the distal one-third on the cutting edge. Each maxilla II has three rounded accessory teeth, and maxillae III and IV have each one tooth. Lateral accessory supports are located from the middle outer sides of maxillae I to bases of maxillae III (Fig. 7h).

Remarks. *Lumbrinerides acutus japonicus* is similar to the stem species, *L. acutus* (VERRILL, 1875) in the structure of the maxillae figured by PERKINS (1979, p. 418, fig. 1a) and MIURA (1980, p. 1026, fig. 3A) and in having two visible peristomial segments and three reduced pairs of anterior parapodia. However, this new subspecies is separable from the stem in the occurrence of simple hooded hooks beginning on the fourth to fifth setiger, instead of the 12th to 20th setiger.

Lumbrinerides acutus japonicus is also similar to *L. aberrans* (DAY, 1963) and *L. neogesae* MIURA, 1980, both from South Africa, in the structure of the maxillae. However, the subspecies is separable from the two latter species in the number of anterior reduced parapodia: *L. acutus japonicus* has three pairs of reduced parapodia, instead of six in *L. aberrans* and eight in *L. neogesae*.

Type series. Holotype, NSMT-Pol. H 202; paratypes, NSMT-Pol. P 203.

Distribution. Japan.

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